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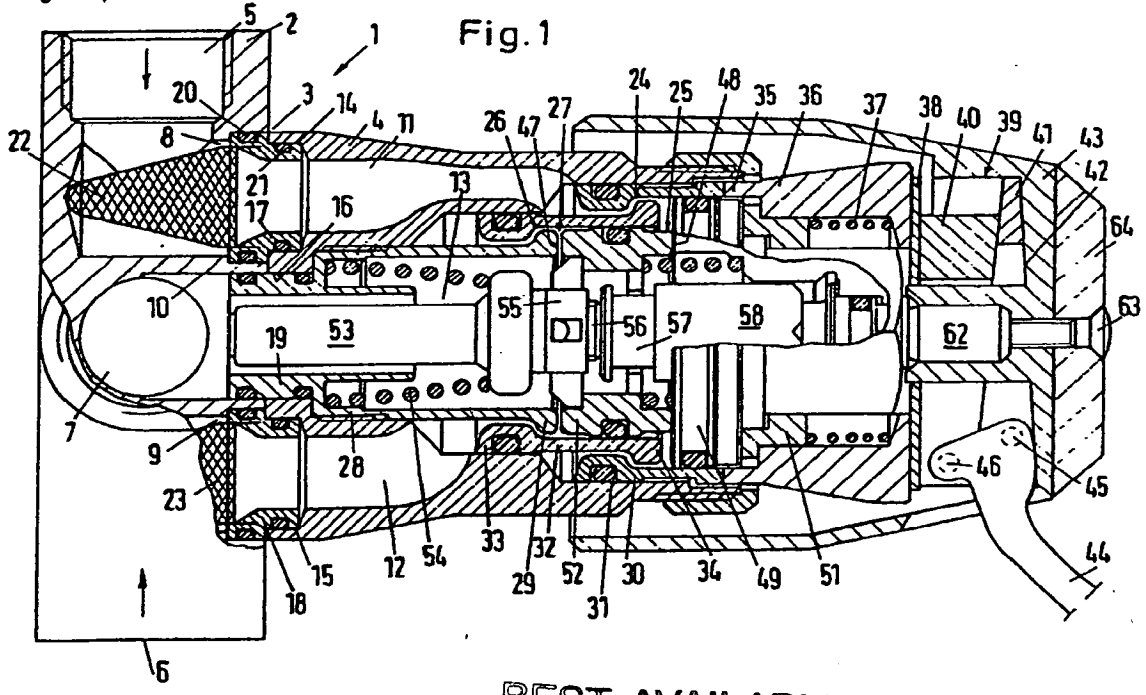
(54) Thermostatic mixing valves

(57) A thermostatic mixing valve comprises a temperature-setting means (43) with two oppositely adjustable cold and hot water temperature-regulating valve structures (25, 27), which are formed by a valve element (52), actuated by a thermostatic element (53); and temperature regulating valve elements (48, 47). In addition, there is a flow-setting means (39, 44) for setting the flow of mixed water. The flow-setting means controls cold and hot flow-setting valve structures (24, 26) which precede the temperature-regulating valve structures (25, 27). The flow-setting valve structures (24, 46) are formed by two flow-setting valve elements (28, 30), axially adjustable relative to each other by the flow-setting means (39, 44) and a common valve element (32) which takes up a position depending on the pressures in the cold water supply and the hot water supply. That results in a temperature for the mixed water which is for the most part independent of the flow setting and pressure fluctuations.

Fig.1



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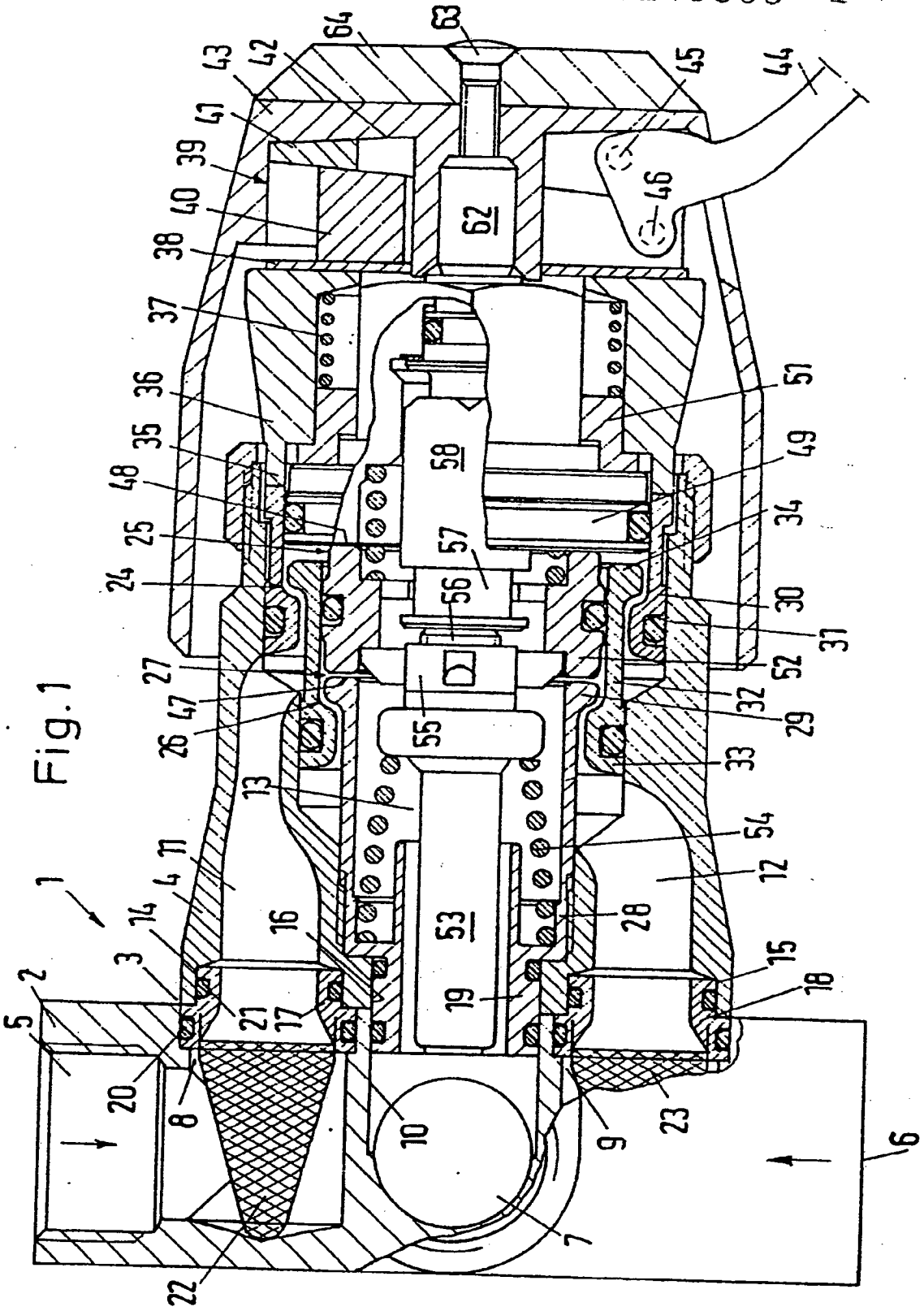


Fig. 1

Fig.2

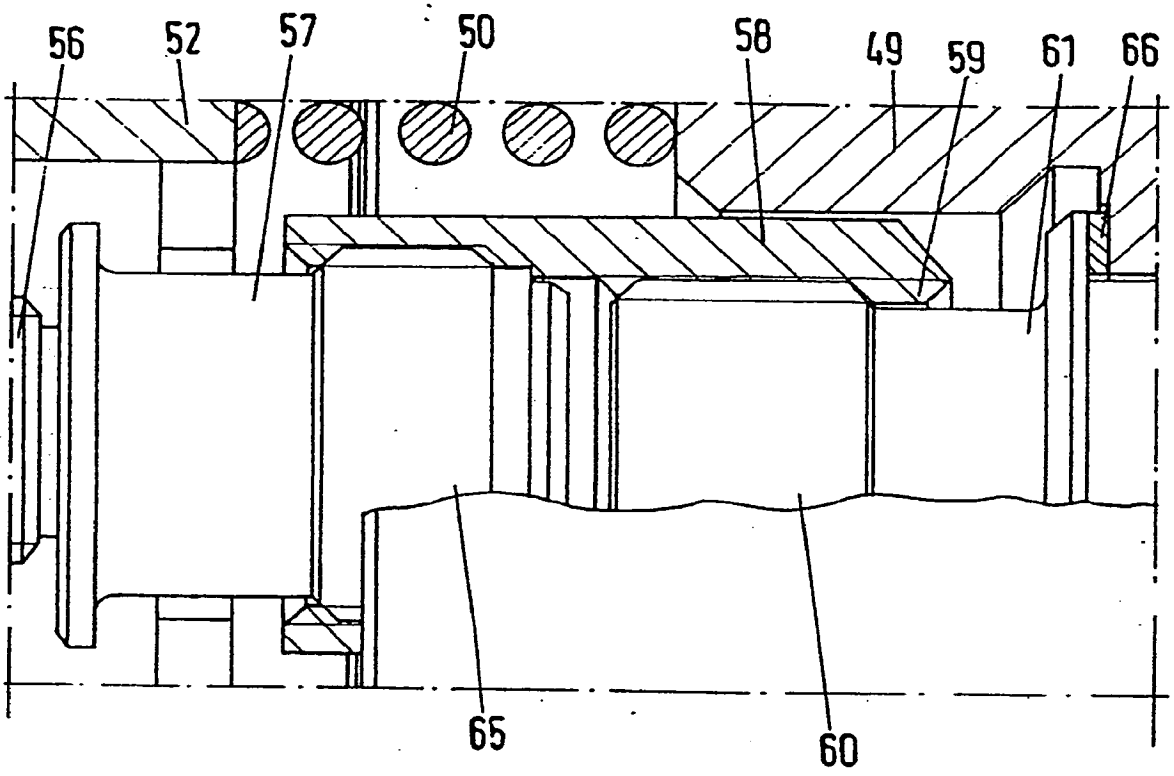


Fig.3

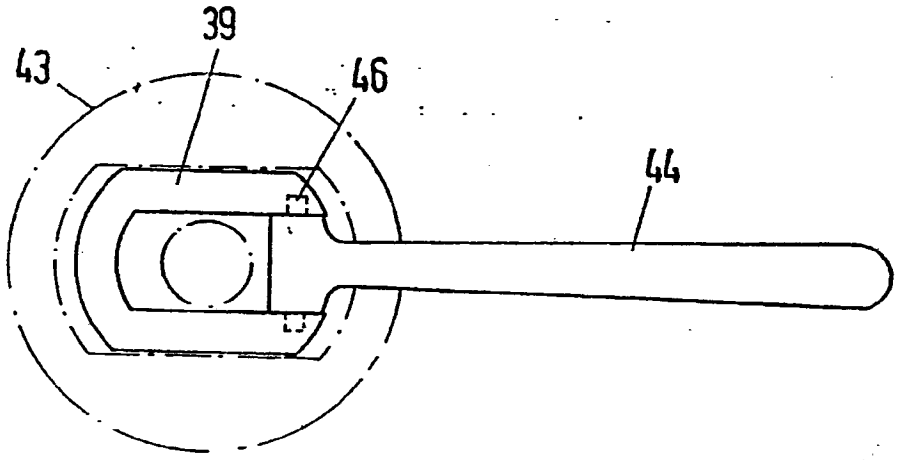
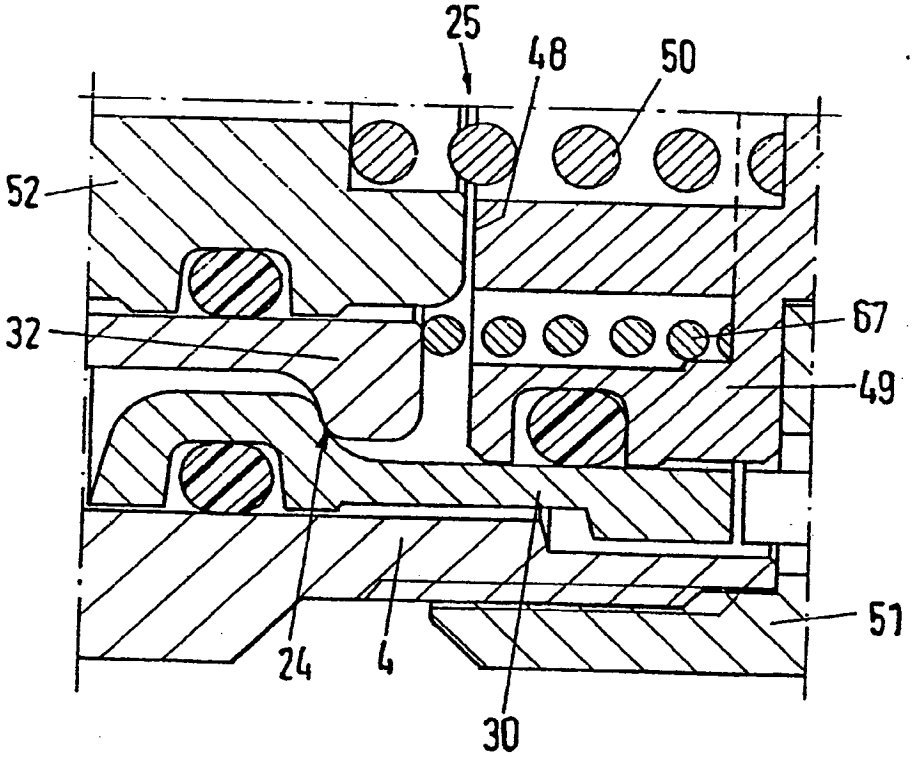


Fig.4



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THERMOSTATIC MIXING VALVES

This invention relates to thermostatic mixing valves.

United States patent specification No. 3,228,603 discloses a thermostatic mixing valve comprising a housing, a thermostatic operating element, provided with a temperature setting means, for actuating a first valve element which, with two temperature-regulating valve elements, forms cold and hot water temperature-regulating valve structures adjustable in opposite senses, and a flow-setting means for setting the flow of mixed water.

In the known thermostatic mixing valve, the cold and hot water temperature-regulating valves not only serve to regulate the temperature but also the flow. For that purpose, one temperature-regulating valve element is fixed with respect to the housing and the other temperature-regulating valve element is axially adjustable with the aid of a flow-setting means in the form of a knob. A rotary button on the knob permits a desired value temperature setting to be given to the thermostatic operating element and thus to the valve element co-operating with the two temperature-regulating valve elements. By means of the second temperature-regulating valve element approaching the first temperature-regulating valve element, the

temperature-regulating valve structures can also be completely closed, so that it is possible to withdraw the operating element, but not the entire valve element. Upon changing the flow setting, the valve element retains its position in relation to the second temperature-regulating valve element whilst the spacing from the first temperature-regulating valve base changes. That leads to an undesirable temperature fluctuation. Similar temperature fluctuations arise if the pressure relations between the hot water and cold water supply vary.

It is also known to separate the functions of temperature regulation and flow regulation by placing a flow-setting valve in the mixed water discharge passage. Although that gives a simple construction, it leads to the hot water supply and the cold water supply being in constant communication with each other by way of the two temperature-regulating valve structures and thus, if the pressure conditions are unfavourable, the hot water could flow directly into the cold water pipe.

The invention is based on the problem of providing a thermostatic valve of the general type discussed above in which the flow and temperature can be adjusted substantially independently of each other.

That problem is solved according to the invention by the provision of a thermostatic mixing valve which comprises:

a housing,

a thermostatic operating element, provided with a temperature-setting means, for actuating a first valve element which, together with two temperature-regulating valve elements, defines cold and hot water temperature-regulating valve structures adjustable in opposite senses, and

flow-setting means for setting the flow of mixed water, wherein the cold water temperature-regulating valve structure and the hot water temperature-regulating valve structure are each preceded by a respective flow-setting valve structure, and the flow-setting valve structures comprise two flow-setting valve elements axially adjustable relative to each other by the flow-setting means, and a common second valve element which assumes a position, in use, in dependence on the pressures in the cold water supply and the hot water supply.

In such a construction, the flow-setting valve structures are separated from the temperature-regulating valve structures. If one changes the flow setting, the conditions at the temperature-regulating valve structures remain substantially unaltered. Since the flow-setting vlave structures are upstream rather than downstream in relation to the temperature-regulating valve structures, there is no danger in the shut condition that hot and cold water may come into contact with each other. Because of the upstream positioning, however, one requires two flow-setting valve structures.

Since the common valve element assumes a position of pressure equilibrium, it will suffice to predetermine the total flow by the flow-setting means because the apportioning of the flow cross-section between the two flow-setting valve structures will take place automatically. By reason of this pressure dependence, pressure fluctuations in the supply conduit are also automatically balanced out. The set temperature is therefore for the most part constant for a given setting under all operating conditions.

It is particularly favourable if the arrangement is such that on removal of the flow-setting means, the flow-setting valve structures move to the closed position under the influence of the cold and hot water supply pressures and the temperature-regulating valve structures as well as the operating element are axially removable from the housing. By having the flow-setting valve structures upstream, therefore, it is possible to dismantle the more sensitive parts of the temperature-regulating valve structures without the need to operate stop valves in the supply pipes and without completely dismantling the valve.

From a constructional point of view, it is advisable for the two flow-setting valve elements and the second valve element to be of sleeve-like form and to surround substantially concentrically the thermostatic operating element as well as the two temperature-regulating valve structures. This gives a

more compact construction which also facilitates removal of the regulating valve structures and the operating element. In this regard, it is advantageous for the first flow-setting valve element to be fixed with respect to the housing and the second flow-setting valve element to be axially displacable by the flow-setting means. Since only one flow-setting valve element has to be adjusted, the construction is simpler.

It is particularly advisable for the one flow-setting valve element to be a sleeve with an external bead and the other setting-valve seat to be a sleeve with an internal bead, and the second valve element to overlap both beads and, to define the two flow-setting valve structures, to have at one end an internal flange co-operating with the external bead, and at the other end an external flange co-operating with the internal bead. The beads and flanges together form flow-setting valve structures which permit a sealed closure. In addition, they constitute mechanical coupling elements with which the second flow-setting valve element can force the second valve element into the closed position if the said second flow-setting valve element is pushed into its end position by the flow-setting apparatus or the supply pressure.

It is also advantageous for the cold water and hot water supply pressures to act in the same sense, in use, on the second valve element and the second flow-setting valve element such that, on removing the

flow-setting means, the internal flange of the second valve element comes to lie against the external bead of the first flow-setting valve element, and the external flange of the second valve element comes to lie against the internal bead of the second flow-setting valve element. That results in automatic closing of the flow-setting valve structures when the flow-setting means is removed. All forces arising from the water pressure are taken up by the external bead of the first flow-setting valve element.

Preferably, the second valve element is sealingly displaceable on the first valve element. That proximity also leads to the associated flow-setting and temperature-regulating valve structures being closely adjacent. Short flow paths are obtained and a compact construction of the mixing valve.

Further, the end of a sleeve forming the first flow-setting valve element may form the first temperature-regulating valve element. That, again, leads to a compact construction.

The second temperature-regulating valve element may be formed by an insert held in position by its abutting a cover secured to the housing. In that way, the two temperature-regulating valve elements are installed at a fixed spacing from each other so that the same conditions are obtained for all flow settings.

It is also advisable for a cold water and a hot water supply passage to be arranged to two sides of

a mixed water passage containing the operating element. The m xing valve housing is therefore completely free from such passages at the opposite end. That facilitates withdrawal of the temperature-regulating valve components.

Advantageously, the flow-setting means as at least one wedge-like member which is disposed between an axially adjustable transmission element and a sloping surface and is displacable by means of a lever transversely to the adjusting direction. Such a flow-setting means is easy to operate.

The transmission element may have contact fingers engaging through apertures in the cover and acting on the second flow-setting valve element.

It is also favourable for the temperature-setting means to comprise a knob arranged to co-operate by way of a screwthread with a sliding nut to set a desired value for the operating element. The temperature setting obtained by rotation is clearly distinct from the flow setting obtained by actuating the lever.

The sloping surface, the at least one wedge-like member and the lever may be arranged in the knob. That results in a more compact construction.

A thermostatic mixing valve constructed in accordance with the invention will now be described, by way of example only, with reference to the accompanying drawings, in which: